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Productive specialization and the divergence in productivity: The case of Mexico, 1982-2006.

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Abstract

This paper studies the productivity performances of Mexico in international perspective during the period 1982-2006. Mexico adopted a policy of economic liberalisation coupled by some market oriented structural reforms, after a long period of import substitution. However, growth in GDP per capita has been low. Comparing the Mexican economic performance with those of other more developed and developing economies one can observe the divergence of both GDP per capita and labour productivity, in relation to the OECD member countries and other Latin American economies.

Productive and commercial specialisation has geared towards activities associated with global value chains that demand and incorporate very little local technological value and have not necessarily translated into forward and backward linkages with the rest of the economy. There is a significant change in the composition of both output and labour among sectors, and within them; the more dynamic sectors are those featuring a relatively lower productivity. Sectors oriented to the less dynamic domestic markets, feature a high and growing technological heterogeneity. Leading firms in these sectors record significant productivity growth, thereby increasing productivity gaps among industries and sectors of economic activity. Clearly, best productive and technology practices fail to diffuse across industries and the informal sector of the economy is increased.

Characteristic and Trends of the Mexican economy

The dynamism of the import substitution (IS) model came to an end at the beginning of the 1980´s. Following a period of stabilisation and adjustment (1982-1987), Mexico adopted a policy of economic liberalisation coupled by some market oriented structural reforms (1988-2007). The Mexican economy has achieved a considerable macroeconomic stability, after the 1995 crisis, therefore overcoming a very long period of instability and recurrent external shocks, even in the context of economic liberalisation. Over the course of the last decades, the core goal of macroeconomic policy has been price stabilisation; this has been gradually achieved even if with strong fluctuations in particular years. As of the year 2001, inflation rates compared positively with international standards and, with a clear downward

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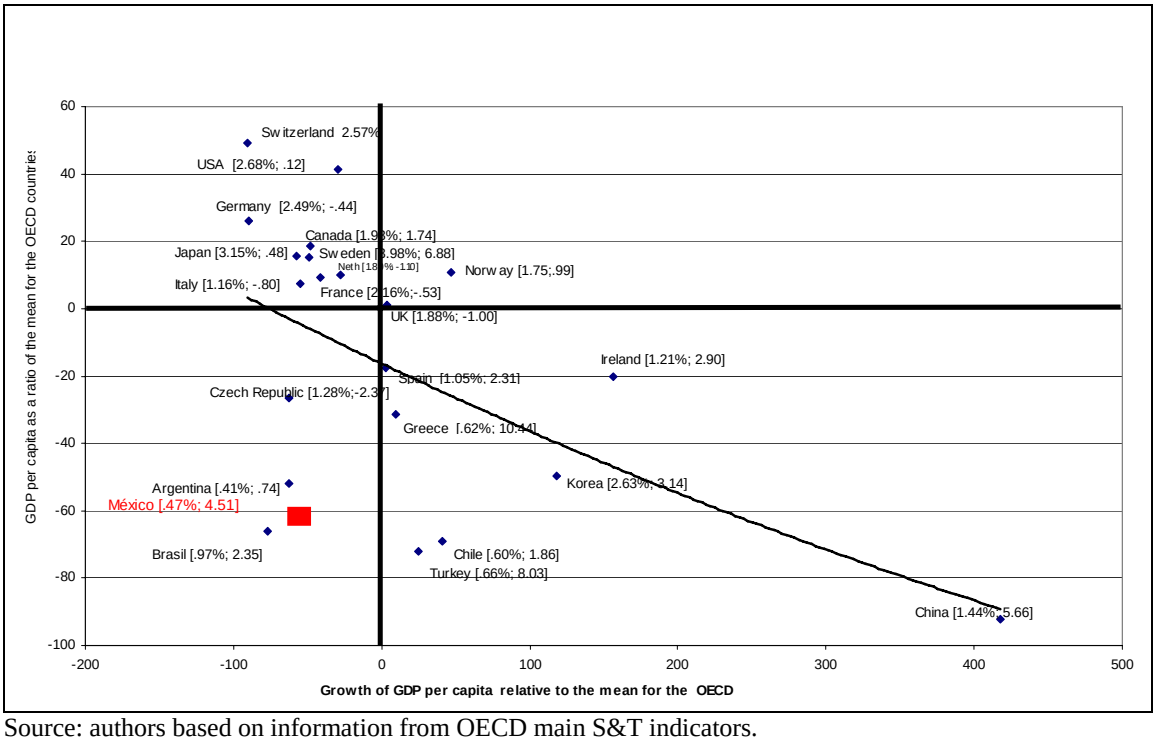
trend. Fiscal deficit has move around levels close to 1.0% of GDP, or even less since 2003; by 2006 the public accounts recorded an overall superavit. Public indebtedness observes a sustained downward trend too; by 2006 it represented 25.5% of GDP. The largest reductions have been recorded in the external component down to a level equivalent to 6.5%; domestic debt has risen in absolute terms but at a pace significantly lower than the aforementioned reduction in total indebtedness. Accordingly, the Mexican economy would have more than complied with the targets set by the Maastricht Treaty: a ceiling for public indebtedness of 60.0% as a share of GDP and a maximum financial deficit for the government in the order of 3.0%. It is worth to stress that these goals were achieved even within a context of stagnation or slight recession. Faced with difficulties to increase fiscal revenues, achievement of the aforementioned goals required the implementation of restrictive fiscal and monetary policies. Higher real interest rates have had negative impacts on the expansion in global demand, public investment and employment.

Since 1994, foreign exchange policy has been of a free floating regime; real exchange rates are on an appreciating trend. The level of international reserves was high and growing up to mid-2006, when it recorded a minor contraction. Surging petrol prices, the expansion of exports associated to activities pertaining to global value chains and, international remittances have led to likely “Dutch disease” effect that pushes the appreciation of the exchange rate.

Management of the public accounts has been adequate; maintaining equilibrium in those accounts has, however limited the adoption of public policies. Average revenue for the public sector (tax and non-tax revenues, in particular petrol-related income) places Mexico at the bottom among OECD countries and, even some developing countries with comparable level of economic attainment. In the period 1991-2001, and as a share of GDP, average fiscal burden in Mexico was about 17.4%; in countries like Greece and Turkey such share represented 33.8% and 26.1% of GDP, respectively. Even when compared to some other representative Latin American economies such as Brazil, Argentina and Chile; Mexico records considerably low levels of fiscal revenues.

During the period 1982-2007 growth in GDP has been low. Comparing the Mexican economic performance with those of other more developed and developing economies one can observe, over the period 1990-2004, the divergence in GDP per capita in relation to the OECD member countries (
Figure 1). Starting from an already lower level of GDP per capita, the Mexican economy grew at a slower pace than the OECD average during the 1990s. While the performance mirrors the one corresponding to some other Latin American economies, it is lower than some dynamic Asian countries. Discrepancies could be even larger if one were to include the 1980’s, a decade characterised by a disappointing economic performance at the regional level. In recent years (2003-2007), the Latin American region recorded high expansion in GDP per capita, the fastest since the years 1970’s. Mexico, however, maintains a lower rate of growth, therefore lagging behind the rest of Latin America.
Figure 1 shows the relative position of some selected countries according to their initial GDP per capita and the subsequent rate of expansion over the study period. As would be expected, the bulk of countries with the highest levels of initial GDP per capita grew at a pace lower than the mean; in contrast, those with lower starting levels grew at a faster rate.

Figure 1 Convergence of GDP



Source: authors based on information from OECD main S&T indicators.

Figure 1 includes information about both the level of GERD as a share of GDP for the latest year for which information is available and, the average annual rate of growth for this variable over the period of study. For example, Mexico [0.47%; 4.51], means that in 2004, Mexico reported a GERD to GDP ratio (GERD/GDP) equivalent to 0.47%; the average growth rate of the indicator was in turn, 4.51% per annum over the period 1990-2004. The value along the Y-axis (-61.0) expresses the GDP per capita for a given country as a percent of the mean for the OECD countries in 1990. On the other hand, values along the X-axis (-55.5) show the increase in the GDP per capita, expressed in percent, relative to the mean of the OECD during the period 1990-2004.

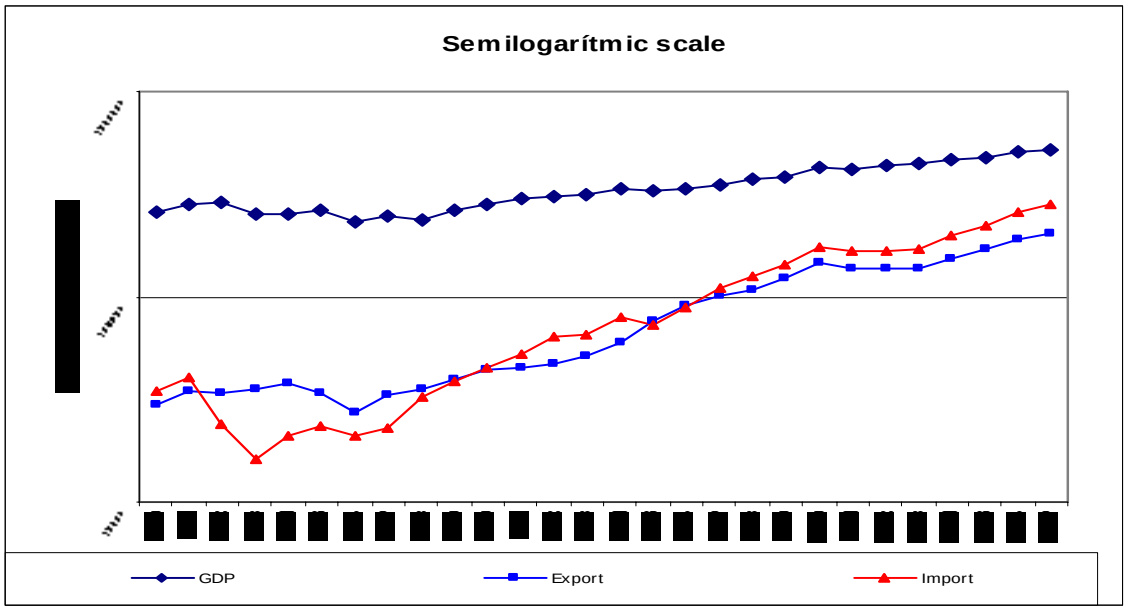
The Mexican economy has undergone significant transformations over the last 20 years or so. This is, in part, the result of the economic policy interventions, compounded by global economic and technological processes that impact global production and trade. During this period, the economy transited from a situation of economic crisis and macroeconomic instability, to a period of relative stability with low rates of growth.

Evolution of the International trade

During the IS period, the rate of expansion of Mexican exports most of which came from non-manufacturing activities; was relatively low. This situation eventually bounded the model viability as the lack of export capacity rapidly exhausted the possibilities to continue

with the substitution. In contrast, during the period starting in 1988, international trade has grown at a significant pace (Figure 2).

Figure 2 Mexico: GDP and foreign trade (Millions of dollars of 1993)



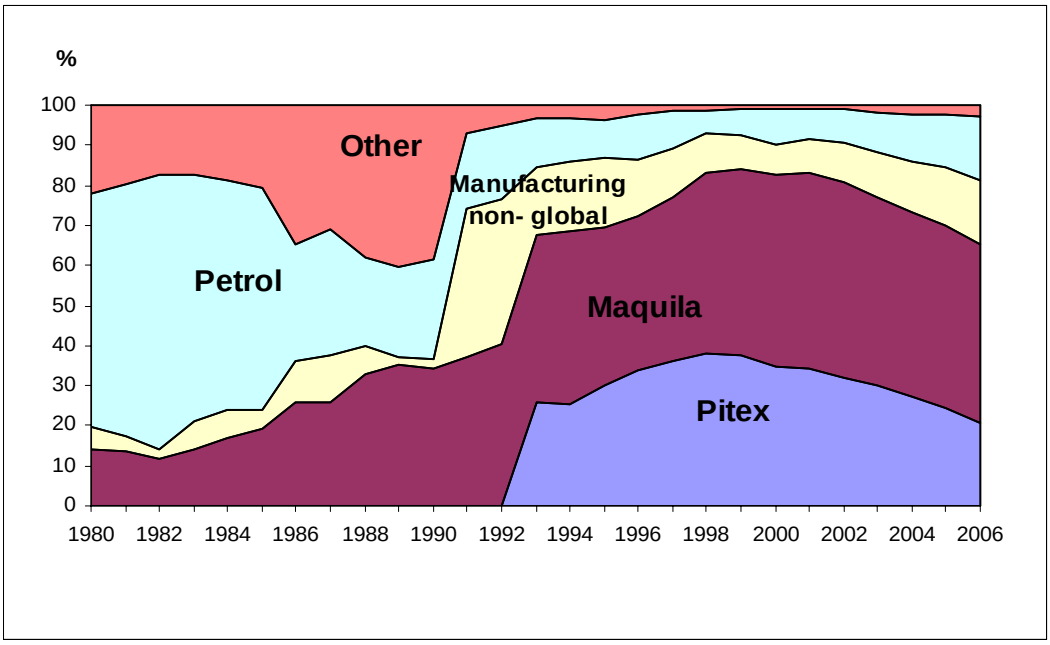
Source: INEGI, Banco de Información económica, Bancomext, Atlas de Comercio Exterior, and Sistema de Cuentas Nacionales de México, several years.

Export composition shows that those from the manufacturing sector increased their share from 20% to about 85% of the total in about two decades (Figure 3). This points out at a trend towards reduction in the weight represented by petrol exports. Even though in recent years, the surge in international petrol prices has allowed an increase in such exports in terms of value, as noted earlier, they show a decreasing trend in terms of volume. In this context, one could say that whereas the former IS model characterised by an inter-industry trade, the current model of liberalisation and deregulation corresponds with an intra-industry kind of foreign trade. This is likely to be true as global processes imply import and export flows of goods corresponding to specific activities. However, the determinant factors upon which Mexican competitiveness builds remains cheap labour costs and geographical proximity to the US. Hence, even if foreign trade takes place “intra-industry”, it is not based on increasing returns but on relative prices of the productive factors; in addition, the geographical location allows interaction at low costs, between plants in both sides of the border. This is in fact, the place with the largest concentration of these activities.

Composition of manufacturing exports changes significantly during the period of study (Figure 3). Those products associated to global value chains (PITEX-Maquila) show a relevant increase in both absolute and relative terms, reaching a share of 90% or more of

total manufacturing exports. [2] Value of manufacturing exports exceeds the value of the product. Exports are focused on two manufacturing divisions, including very few specific activities and products, thus determining a high specialization.

Figure 3 Mexico - Export structure by sector of origin, 1980-2006



Source: INEGI, Estadísticas de Comercio Exterior and Bancomext, Atlas de Comercio Exterior

"Definitive" exports with a higher level of national integration account only for about 10% or so of the remaining value. Notwithstanding their growth in absolute value, they show a clear downward trend in their relative share among manufacturing exports. In addition, manufacturing exports are highly concentrated in a reduced number of economic activities, thereby determining their high specialisation.

Imports, in turn, are "definitive" in 48% and mainly directed either to productive processes specialised in the domestic market or, final consumption. Internationalised processes show a large and increasing positive trade balance; yet they are insufficient to compensate the deficit associated with domestic demand for definitive imports. Maquila industry imports goods at a ratio close to 78% of exports value, accounting for a low local integration level. The percentage represented by the value-added and the national goods in the production value (local integration) tends to rise as from the crisis and devaluation that took place in 1995. Pitex programs (temporary import) have a local integration level higher than maquila,

[2]Maquila-related activity and that associated with the Pitex programme (Programme in support of temporary import of goods for subsequent export) facilitates international trade. Firms participating in the programme are exempted, ex ante, from the payment of applicable tariffs on the grounds that the final products would subsequently be exported. In contrast, "definitive" imports directed to intermediate or final consumption in the local market are liable to the payment of tariffs. "Definitive" exports are those that take place independently of the Pitex or Maquila programmes; they exclude imports under such tariff regimes.

and a similar trend, allowing for achieving a higher surplus, in spite of the lower volume of exports. (Table 1).

The relative importance of the export-oriented activities in the context of global value chains has increased in both quantitative and qualitative terms. Their contribution to foreign trade and attraction of hard-currency inflows is significant. The bulk of those exports are directed to the US market; hence, they are highly conditioned by the demand from that country and the comparative performance of possible competitors at the international level.

Table 1 Mexico. Foreign trade balance (Millions of dollars)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EXPORTS															
Total	51832	60817	79541	96004	110237	117442	136703	166424	158443	160763	164860	187999	214233	249997	271293
Definitive (a)	16678	19218	24436	26785	25262	19924	21889	29173	27033	31015	37854	50027	64581	86321	
Maquila (b)	21853	26269	31102	36924	44972	52782	63749	79387	76881	78098	77405	86952	97401	111824	
DCR - PITEX (c)	13301	15329	24002	32294	40003	44737	51065	57864	54529	51649	49601	51020	52251	51853	
Porcentage (b+c)	68	68	69	72	77	83	84	82	83	81	77	73	70	65	
IMPORTACIONES															
Total	65365	79345	72453	89469	109808	125242	142064	174473	168396	168679	170551	197303	221414	256130	282290
Definitive (a)	44010	47185	31044	38756	49431	56227	62596	76793	80507	81265	84988	99207	115489	138599	
Maquila (b)	16442	20466	26179	30505	36332	42557	50409	61709	57599	59296	59058	68624	75129	87503	
DCR - PITEX (c)	4913	11694	15230	20208	24045	26459	29058	35971	30291	28118	26505	29472	30797	30028	
Porcentage (b+c)	33	41	57	57	55	55	56	56	52	52	50	50	48		
Balance															
Total	-13533	-18528	7088	6535	429	-7800	-5361	-8049	-9953	-7916	-5690	-9304	-7181	-6133	-10997
Definitive	-27332	-27967	-6608	-11971	-24169	-36303	-40707	-47620	-53474	-50250	-47134	-49180	-50908	-52278	
Maquila	5411	5803	4924	6420	8640	10225	13340	17678	19282	18802	18348	18328	22272	24321	
Temporary	8388	3636	8772	12086	15958	18278	22007	21893	24238	23531	23096	21548	21454	21825	
INTEGRATION MAQUILA AND TEMPORARY															
M/X Maquila	75.2	77.9	84.2	82.6	80.8	80.6	79.1	77.7	74.9	75.9	76.3	78.9	77.1	78.3	
M/X Temporary	36.9	76.3	63.5	62.6	60.1	59.1	56.9	62.2	55.5	54.4	53.4	57.8	58.9	57.9	

Source: Bancomext, Atlas de Comercio Exterior, several years, INEGI and ECLAC.

Three factors are relevant for the analysis of the performance of the international sector in Mexico: (i) the evolution of the US economy. The extraordinary growth recorded by activities associated to global value chains (maquila-Pitex) has greatly enhanced complementarities between the productive activities in both countries: the US accounts for the largest share of Mexican exports (85%), and a significant share of its imports (50%). This has led to a situation whereby the corresponding rates of GDP growth maintain a close correlation since the economic crisis of 1995; as **¡Error! No se encuentra el origen de la referencia.** shows, this situation has no precedents in previous years. (ii) The evolution in the terms of exchange, more specifically those associated to petrol prices and relative wages. Last but not least, (iii) the real exchange rate that, in the Mexican case, has observed an appreciation of the local currency (Mexican peso) for long periods of time. Although this has served stabilisation goals, it has had negative impacts on the economic activity.

The positive trade balance in those sectors associated to global value chains has been sizable, so as to help the financing, albeit partially, of the considerable deficits resulting from the rest of economic activities. Both results –global surplus and local deficit– belong to one same openness process and they shape the new model of production and business

specialization. Thus, it results in the concentration of exports related to global processes in Mexico on a reduced number of products, exported by few multinational companies and aimed at only one market. Imports intended to global production are also mainly originated in the United States. This situation is not convenient for Mexico's economy, since a sustained growth requires the diversification of exports and imports, both regarding products and geographical places of origin and destination. In addition, extraordinary income derived from surging petrol prices, together with remittances, and significant capital inflows have contributed to finance the deficit in the trade balance.

The composition of output and employment

The composition of output and employment has modified in significant form in the last two decades. The low dynamism in Agriculture has determined a lost in its share in GDP; the process deepened in the last decade following the adoption of NAFTA. The lost took place regardless of the high heterogeneity of the sector (Romero and Puyana, 2004). Mining, including Petrol extraction, has also lost weight even if only marginally. The Service sector increased its participation in GDP, with the highest dynamism recorded in Financial and, Transport and Telecommunication services, respectively.

Composition of the Mexican manufacturing production by types of products was modified, thus making the activities with greater presence globally more important. The structural change has a double meaning: the composition based on divisions and branches of activities is changed, and within some of these, the relative importance between global and non-global processes is also modified, reducing level of production local integration and changing the technological features of the production processes.

The greatest dynamism of the industrial production in the country belonged to the Division of metallic products, machinery and equipment, which is featured by a high participation in global production processes. Within this area, the automobile and electronic industries stand out, which have had a significant upturn since 1988. Among the traditional activities, the food sector remains relevant, accounting for a significant change compared to the previous trend; and based on its nature, it is not a feature of a virtuous process, particularly because exports are low. The Division of chemical substances, oil derivatives, rubber and plastic goods has lost importance as from the market openness in 1988, although they represent processes of high production potential, since Mexico has plentiful goods that might promote production and interaction of the branches. Within this division, commodities specialization (low value-added merchandise) stood out. Likewise, textile, clothing, leather and footwear Division continued to lose ground at a lower rate, in spite of the upturn in the production of garments, related to global production. In both previous activities, production of end products grew on a larger scale than productive goods, resulting in the break of local productive chain links. This situation is based on the reduced relation of global production chains with the rest of the productive activities. The structure of the manufacturing production is modified as a result both of the segments within the global value chain in which the economy centers targeted to export and of imports that

replace the local production, upon the openness or currency availability generated by the new way of insertion within the marketplace.

Table 2 Mexico. Sectoral Structure of Gross Domestic Product (1970-2006).

(Millions of dollars of 1993)										
	1970		1988		2000		2005		2006	
		%		%		%		%		%
TOTAL	459280		958230		1475927		1614524		1692020	
AGRICULTURE, HUNTING, FORESTRY AND FISHING	44207	9.63%	65980	6.89%	80935	5.48%	87801	5.4%	92015	5.4%
MINING AND QUARRYING	5104	1.11%	15134	1.58%	19134	1.30%	21157	1.3%	21622	1.3%
MANUFACTURING INDUSTRY	91421	19.91%	178416	18.62%	317092	21.48%	314883	19.5%	329683	19.5%
FOOD, DRINK AND TOBACCO	25900	5.64%	47429	4.95%	75332	5.10%	84271	5.2%		
TEXTILES, FOOTWEAR AND LEATHER	12192	2.65%	17408	1.82%	26301	1.78%	21141	1.3%		
WOOD CORK AND FURNITURE	3943	0.86%	7104	0.74%	8343	0.57%	7432	0.5%		
PAPER AND PRINTING	4433	0.97%	9077	0.95%	14050	0.95%	13562	0.8%		
CHEMICALS	9685	2.11%	30418	3.17%	45870	3.11%	46710	2.9%		
OTHER NON-METALLIC MINERAL PRODUCTS	7445	1.62%	13920	1.45%	20684	1.40%	22537	1.4%		
BASIC METALS	4053	0.88%	8863	0.92%	15219	1.03%	16035	1.0%		
METAL PRODUCTS AND MACHIMERY	18608	4.05%	39733	4.15%	101889	6.90%	94115	5.8%		
OTHER MANUFACTURING	5163	1.12%	4464	0.47%	9405	0.64%	9067	0.6%		
CONSTRUCTION	25876	5.63%	43240	4.51%	62859	4.26%	68563	4.2%	73294	4.3%
ELECTRICITY, GAS AND WATER SUPPLY	4240	0.92%	16114	1.68%	26217	1.78%	28656	1.8%	30089	1.8%
WHOLESALE AND RETAIL TRADE; RESTAURANTS AND HOTELS	92149	20.06%	202530	21.14%	321839	21.81%	350794	21.7%	363773	21.5%
TRANSPORT AND STORAGE AND COMMUNICATION	32632	7.11%	87505	9.13%	165469	11.21%	214680	13.3%	234216	13.8%
FINANCE, INSURANCE, REAL ESTATE AND BUSINESS SERVICES	64896	14.13%	146785	15.32%	229781	15.57%	286021	17.7%	301467	17.8%
COMMUNITY SOCIAL AND PERSONAL SERVICES	107233	23.35%	226562	23.64%	294485	19.95%	302701	18.7%	311177	18.4%
Imputed bank services	-8478	-1.85%	-24039	-2.51%	-41882	-2.84%	-60721	-3.7%	-65534	-3.9%

Given the intensive use of employment factor by the activities belonging to global production processes, effects over composition of employment were of a greater magnitude than those registered in the value-added. The employment in the manufacturing sector has maintained a relatively stable participation within the economic activity in the aggregate. In the global economy, employment has grown significantly, while in the rest of the manufacturing activities (non-global sector), it has decreased. Global production presents high personnel turnover, particularly workers, which can be over 21% monthly in some periphery areas.

Changes in the composition of employment are associated with relative shifts in the orientation of productive activities toward export-oriented sectors and, the enlargement of the informal sector of the economy. In general, export-oriented manufacturing sectors correspond with activities linked to global value chains (maquila and Pitex), characterised by high labour intensities and wage compensation below the average for the whole manufacturing sector. Outstanding growth in these activities has transformed the formal component of the labour market.

In parallel, there are productive activities with very unequal levels of productivity. Rather than the direct result of intrinsic characteristics of those activities or their uneven capital/labour ratio requirements, differences in productivity result from the structural heterogeneity of the economy. Heterogeneity in this context is understood as the

connivance of economic activities very close to the technological condition and use of knowledge and with very appropriate factor combinations; and other activities characterised by laggard technological and organisational conditions, with inefficient factor combinations and, low remunerations. Moreover, competitive conditions in the latter group of activities that hinder the operation of market selection mechanisms.

All the above translates in a situation where labour markets are filled with people in informality with very low levels of productivity. In some cases, subsistence activities supplement with family and community strategies that combine low efficiency jobs in agriculture or in activities associated with global value chains or, international migration. This contributes to an inefficient allocation of productive resources in highly imperfect or indeed, inexistent markets.

Open unemployment levels in Mexico, about 3.0% of the Economically Active Population (EAP), are low compared to international standards. Positions in the informal, low remuneration sector have increased, though. From 5.0% of the EAP in 1980, informality reached 24.0% in the year 2000.

Average remunerations of employed labor in Mexico had really reached the highest level by the mid-seventies, and after some stability, they plunged with strong fluctuations at the beginning of the eighties. During the ISI period (Import Substitution Industrialization), average remunerations increased steadily its purchasing power, particularly in the seventies. The most significant contractions of the economy are the crisis followed by partial recoveries. In general, average remunerations of workers of IME (Maquila export industry), which can be considered as a global indicator, though they are higher than those of the aggregate economy, are lower than those of the manufacturing companies and seem to mix with these for the remuneration reduction at an uneven rate. However, it is important to assess the composition of the average remunerations, made up by workers' wages and employees’ salaries.

According to the information of national accounts, average wages of workers of maquila plants have been slightly lower than those of the rest of the manufacturing plants, with a trend to catch up with them. By the year 2000, average salaries of IME and of all manufacturing plants were similar. On the contrary, average salaries of employees in IME are significantly higher than the aggregate of the manufacturing plants. However, the employees/workers ratio is much lower than the one present in other manufacturing plants, thus average remunerations of employed labor are lower. Lower payments in maquila industry are determined by the employment composition and not by the amount of remunerations for the different employment qualities.

The new economic policy facilitated the incorporation of Mexico to new trends of foreign trade, making good use of closeness and compatibility with the economy of the United States to foster an economic development supported by manufacturing exports. The new productive and business specialization of manufacturing companies within this openness

context mostly tended toward global production processes. Those processes operated under the requirements of the American economy, which was facing strong competition in sectors with high labor costs, and whose survival in the United States required the internationalization of certain stages of the productive processes. Growth rate of global productive activity was very high, and constantly higher than the remaining manufacturing activity, thus raising its participation in the different indicators. Particularly, global manufacturing value-added share rose from 3.6% to 24% and for employed labor from 11.5% to 43% during the 1988/2003 period. The employment growth in global activities only compensates for the absolute loss being registered in the employment of the remaining manufacturing activities.

We can conclude then that internationalization of production processes through activity related to global processes has changed, in a relatively short period, the structure of the manufacturing activity in the aggregate, based on its high dynamism and increasing importance. The new structure of the production, with leading and prevailing global production activities has been highly specialized in very few activity branches regarding the economy as a whole. As a result, sensitivity to performance of those relevant activities and to consequences of the structural and technological changes operated internationally in those activities increases.

Trade openness and deregulation of the economy resulted in a new development model in which participation in global production or chains plays a prevailing role in manufacturing activities. End products made through these processes result from different activities, carried out in different nations and traded throughout the world. Global production processes are not made through autonomous market operations among independent agents; there are articulated networks of productive agents making up global production chains, and they require specific organizational capabilities. Coordination and management of the global production chain is a key competitive factor and it founds its geographical distribution on the purpose of reducing costs, generating productive and technological capabilities and accessing to the world market.

Technological effort in the productive activity

Sectors oriented to the less dynamic domestic markets, feature a high and growing technological heterogeneity. Leading firms in these sectors record significant productivity growth, thereby increasing productivity gaps among industries and sectors of economic activity. Clearly, best productive and technology practices fail to diffuse across industries and sectors (Capdevielle, 2005).

The globalised sector of the economy contributes with 80.0% of added value and more than 90.0% of high-technology manufacturing exports. High- to Upper-medium technologically intense activities have got a larger importance for the Maquila Industry (Electronics-Autoparts); yet, the industry participates in the production of low-technology intensity goods (Textile products). The PITEX programmes centre in the production of medium-high technology intensity products (Automobiles). Sectors oriented towards the domestic market characterise by low-technology intensity activities that in turn, have increased their share in added value. It is worth to note that the technological intensity featured by goods associated

to global value chains does not imply that such value is generated locally. This is explained in part, by the fact that those segments of the manufacturing process in which Mexico specialises are intensive in poorly-skilled labour. In addition, there is a dearth of significant R&D efforts. Indicators on innovatory efforts carried out in Mexico do not show a clear and positive relationship between the technological intensity of economic activities and the share of the GERD in added value. This holds even if the GERD is slightly bigger for those divisions of the economy included in high-technology activities.[3]

If one compares the GERD financed by the productive sector in some of the main OECD countries, with the situation in Mexico (

Table 3), we see that the level of expenditure is significantly lower in our country. Although the difference in low-technology intensity sectors is hardly significant, in those characterised by higher technological intensities, it is rather deep. The productive sector in Mexico performs low and homogeneous R&D efforts; in contrast, in the more developed countries whereas the expenditure is larger, it is also highly dispersed across sectors with distinct technological intensities. This behaviour is explained by the relevance gained by global value chains (Maquila y PITEX). In some cases, firms participating in those chains produce locally, some high-technology goods; yet, their contribution is in the labour intensive stages of the manufacturing process. In addition, those activities lack or are poorly linked to the local productive base -a significant share of inputs are imported-, or with the rest of the agents in the national innovation system.

[3] See in section 3.1.1 other characteristics of these sectors and their innovation activities.

Table 3 Mexico: R&D Intensity, selected sectors

Classifcation by technological intensity	R&D / Value Added		
	OECD	Mexico	Gap Mexico/OECD%
High-technology Industries			
Pharmaceuticals	22.3	0.35	1.56
Office equipment, accounting and computing machinery	25.8	0.11	0.41
Radio, TV and communications equipment	17.9	0.04	0.20
Medical, precision and optical devices	24.6	0.15	0.60
Upper-medium technology industries			
Machinery and electric appliances	9.1	0.49	5.38
Motor vehicles	13.3	0.44	3.31
Chemical Products (Except Pharmaceutical)	8.3	0.79	9.50
Other transport equipment	8.7	0.18	2.11
Other machinery and equipment	5.8	0.02	0.26
Low-medium technology industries			
Rubber and plastic products	3.1	1.04	33.68
Carbon, Petroleum Derivates and Nuclear Energy	2.7	0.18	6.77
Fabricated Metal Products (Except Machinery)	1.9	0.29	15.30
Basic metal and metalic products	1.9	1.10	57.92
Low-technology industries			
Other manufacturing	1.3	1.29	99.59
Good, paper, printing and publishing	1	1.37	137.03
Food, beverages and tobacco	1.1	0.11	10.43
Textil, textile products, leather	0.8	0.21	26.18
Total Manufacturing	**7.20**	**0.45**	**6.30**

1. Based on data from 12 OECD countries: US, Canada, Japan, Denmark, Finland, France, Germany, Ireland, Italy, Spain, Sweden, UK
Source: OECD: At-JBERD and STAN databases, May2003

An additional and relevant indicator on the limited technological performance in Mexico relates to the reduced and decreasing number of patents taken by local firms. IPR

legislation was modified since the beginning of the last decade, therefore improving compliance with property rights. However, the trend in the number of patent applications by country of origin of the inventor shows the extraordinary growth in the applications presented by non-resident firms; in contrast, patent applications by local firms has gone down. Although in general, the indicator on the number of patents in developing countries underestimates effectiveness in innovation, the reduction in absolute terms, in the number of patents, and in the context of a rapid expansion in patenting activities, is an indication of the marginal role and technological subordination feature by local firms. On the other hand, growing numbers of patent applications and obtained by non-resident firms is an indication of the insertion of those firms in global output and trade flows, thereby demanding the guarantee to their intellectual property as the basis for technology transfer.

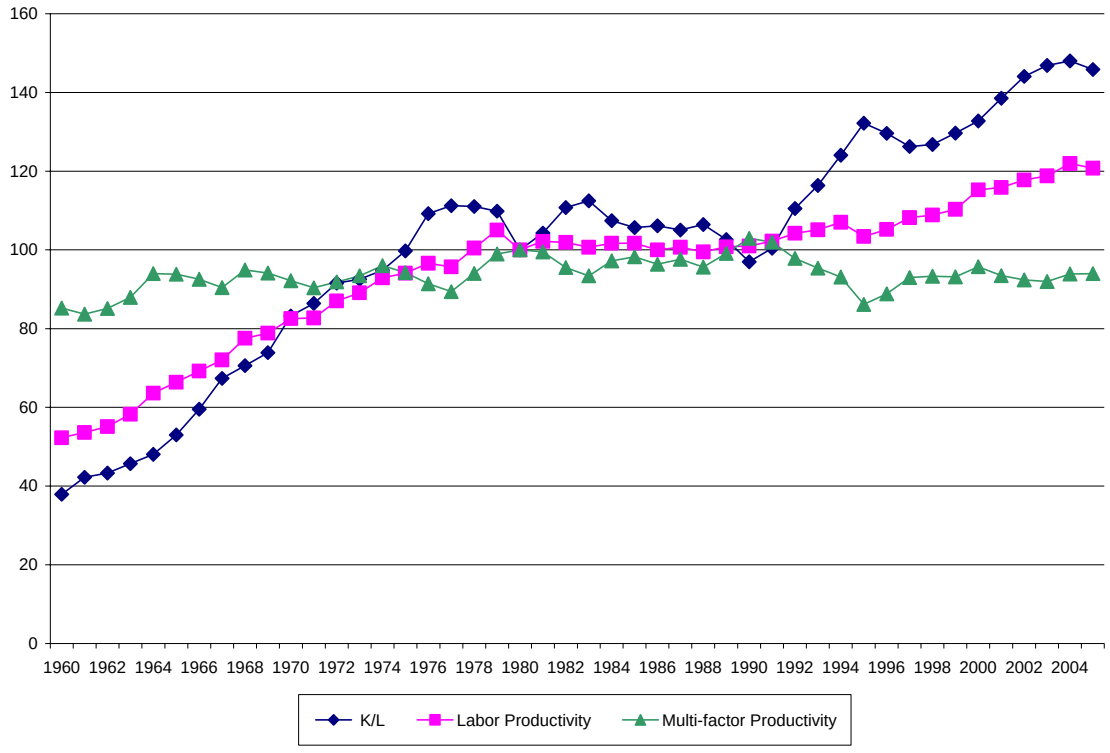
Finally, the costs borne by the Mexican economy for failing to develop its technological capabilities are reflected in the results of the technology balance of payments; this feature a high and growing deficit. This in contrast with some developed economies that finance their S&T efforts by taping on the income obtained through their technological exports. This deficit implies dependence and at the same time, an external technology transfer. Accordingly, its trend and likelihood to either crowd-in or, crowd-out local technological capacities are key elements to be observed; this is together with other indicators on productive performance. Some economies with high productive and technological performance do run considerable deficit too; they use it to bridge the technological gaps they face in relation to more developed countries and, to support the development of their own capacities over time. However, a growing deficit that fails to correspond with a productive dynamism and a virtuous specialisation is likely to denote deficiencies in the national productive and innovation system. Payment for the use of technology constitutes a transfer of technology rents that explain the aforementioned situation of producing high-technology goods but with a low local content of added value. This is a situation reflecting either the initial step to introduce and develop frontier technologies or, a situation of permanent lack of technological capacities.

Productivity in Mexico

Recent studies on labour productivity (LP) and Total Factor Productivity (TFP) in Mexico differentiate the results of the development models implemented in the economy in two different period, the IS (1950/1981), characterised by the orientation of production to the domestic market and a high presence of the government sector in the regulation of the markets and directly in the production. The second period, in turn, was marked by the deregulation and opening up of the economy (1988-2007). Between this two periods it is possible to identify a critical administration (1982/1987) in which the IS came to an end leading to an economic crisis. The period comprises the corresponding policies of stabilisation and adjustment setting the basis for the subsequent liberalisation. Regardless of whether we could include this transition period either in the IS or the liberalisation period, it is important to understand the significant transformation occurred in the main economic, efficiency and features, the overall welfare.

Regardless of the differences in their analytical methods and sources of information, it is possible to find some regularity in the several studies about productivity performance of the Mexican economy over a long term perspective. In the past 50 years or so, TFP has remained virtually unchanged (Figure 4). During the phase of industrialisation of the IS model, TFP growth was rather limited. This is in spite of the considerable expansion in average labour productivity resulting in turn, from the increased capital intensity per worker that accompanied rapid economic growth. In this period investment growth was driven by the private sector, national and international; but also by the public sector. The latter intervened actively and directly in the economic activity by means of public firms and the construction of infrastructure. Financing to public investment was possible through borrowing from external capital markets, with special strength towards the end of the period.

Figure 4: Mexico - multi-factor productivity



Source: Banco de México, Acervo y formación de capital fijo neto 1960-2005
INEGI, SCNM, Value added, Employment, several years.

In the period 1982/1987, contraction in the general level of economic activity and investment was accompanied by significant reductions in both labour productivity and TFP. This period characterises by implementation of programmes geared towards macroeconomics stabilisation in a recessive context. Such policy interventions had a strong impact on the behaviour of the productive agents and operation of the markets. The debt

crisis of 1982 limited the possibilities for public investment and, within a recessive context, failed to induce private investment.

At the end of the 1980's, privatisation of public enterprises, commercial liberalisation and economic deregulation became attractive factors for private investment. Once more it is possible to observe an expansion in labour productivity associated with an increase in capital intensity; TFP however, remained little changed, therefore determining a situation in which, according to diverse methods of counting and sources of information, it either decreased or stayed stagnated. In this period, the economy as a whole and labour productivity in particular, grew at a pace lower than in the IS period; the trends at the start of the new millennium are towards stagnation of the productivity.

Analysis of the effects associated with the sectoral redistribution of resources on the performance of productivity show that such redistribution has had positive effects during the IS period; yet, these have been negligible or negative during the phase of economic liberalisation. There is a significant change in the composition of both output and labour among sectors, and within them; the more dynamic sectors are those featuring a relatively lower productivity, whereas those that increase productivity do so by means of fluctuations in the amount of employment. (Hernandez Laos, 2005; Capdevielle, 2005).

The evolution of capital assets is to be assessed since these affect the productivity of labor, with the purpose of differentiating variations of the product that might arise from the increase in their capital amount, which are attributable to a better use of the employment factor. Capital intensity enables to have a model on the contribution of capital accumulation for the development of the product, in spite of the restrictions set by the estimation of the value of capital assets.

As it can be seen on the Figure 4, capital intensity per worker shows great variations, with a sustained growth period since the 70s until the beginning of the 80s. The crisis of the eighties presents labor productivity stagnation while capital assets begin to drop as from 1983 until the 90s. As from the year 1988, with the trade openness, output per worker rate increases until these days. Capital intensity also grows until the 1995 crisis, when a considerable slump begins and continues until the statistical information we have available. Although the effect of the periods of crisis on investment fluctuations -and therefore on capital intensity- is clear, the trend of this variable is different from periods before and after the 80s crisis. Productive specialization in intensive labor activities, related to global production processes, might explain the stagnation trend of capital intensity.

As of the end of the 1980's, labour productivity in the manufacturing sector "no maquilador", has grown as a result of a moderate increase in output and an even slower expansion in employment. Productivity in export-oriented manufacturing activities in turn, has been relatively stable during the whole period of analysis. Productivity however, has been lower than the rest of manufacturing activities and the economy as a whole. Slow rates of expansion of productivity in maquila-related activities take place in a context of very rapid growth in both output and employment in that sector, but at very similar rates. The meaningful difference between the two periods under analysis resides in the divergent

effects derived from productivity growth in the context of expanding or stagnating economic performance, together with an increase in the relative weight of the more dynamic sectors where productivity growth is reduced or without change at all.

Within the different branches of production activities, companies of very different production and productivity scales compete among each other. Since there is no data per productive unit, it is possible to assess information collected through census based on employment sectors in order to sort companies in groups according to their sizes. Since the 80s, productivity gaps between the set of companies belonging to the most efficient segment within a branch (the most profitable) and the average within the same branch have increased. If branches with more companies taking part in global processes are considered, although they have lower absolute productivity level, gaps between the best and the average practices remain relative stable and are not high. Additionally, in some key activities of the global sector (assembly, car pieces, etc.) gaps within the branch tend to reduce. Widening of gaps between branches within a low productivity growth is explained by the lack of disclosure of better production practices or by the survival activity conditions held by the producers, based on low cost and availability of factors of production.

Table 3 México: Manufacturing Industry
Breaches of productivity

	Productivity				PTF		
	1980	1993	1999	Media	1993	1999	Media
Manufacturing Industry	**74.4**	**64.1**	**54.1**		**72.6**	**68.8**	
Food, Drink and Tobacco	71.6	57.3	52.7	60.5	67.2	62.9	65.1
Textiles, Footwear and Leather	74.7	70.0	78.1	74.3	82.1	80.7	81.4
Wood Cork and Furniture	59.2	59.3	60.7	59.7	64.3	54.8	59.6
Paper and Printing	70.0	64.4	62.9	65.8	70.0	64.6	67.3
Chemicals	77.0	84.0	45.7	68.9	67.6	57.4	62.5
Other Non-Metalic Mineral Products	64.2	41.8	44.6	50.2	58.4	60.4	59.4
Basic Metals	91.3	66.7	70.1	76.0	66.7	64.0	65.3
Metal Products and Machinery	77.4	69.8	70.9	72.7	79.0	72.7	75.9
Other Manufacturing	73.2	74.1	66.5	71.3	53.4	72.6	63.0

Source: Censos económicos de 1980, 1993 y 1999

If we use the method of "shift and share" to analyse the factors explaining changes in labour productivity, we can appreciate the determinants and nature of those changes[4]. Since the end of the 1980's, the factor that explains productivity growth in manufacturing is the

4 The method of change and participation decomposes the variation of productivity in three effects: the first corresponds to the redistribution of labour among distinct areas of economic activity; in other words, changes in employment in manufacturing; the second refers to interaction between variation in employment and the corresponding variation in productivities and; the third analyses productivity within each industry.

cumulative effect of growth of that same productivity within each sector of activity. In contrast, changes in output composition by redistribution and interaction is negative or of little relevance during the periods under study (table 2). There is no virtuous change in the composition of employment by shifting labour from low productivity activities to those that are either more productive or with a larger rate of growth in productivity. Relocation of labour from non-maquila to the maquilador sector has gotten a negative effect on average productivity of labour. The growth in this variable can be explained to a great extent, by the increased productivity within each industry in the "non-maquila" sector. Within a context of increased competition in the local markets resulting from trade liberalisation, such productivity growth may originate from downsizing and rationalisation of personnel.

Table 4

Mexico : Manufacturing productivity
Shift and share

Perlods	Componentes			Total- Shift and share	Annual growth rates of aggregate value	Annual growth rate of staff
	Reallocation of vorkers	Interaction	Increase of productivity			
1988-1993	-0.11	-5.19	18.32	**13.02**	4.27	1.75
1993-1998	-5.95	-3.05	22.52	**13.53**	5.29	2.66
1998-2003	0.03	-0.59	12.86	**12.30**	1.56	-0.81
1988-2003	-3.18	-19.80	67.07	**44.09**	4.15	1.44

Mexico - Maquila Productivity
Shift and share

Perlods	Componentes			Total- Shift and share	Annual growth rates of aggregate value	Annual growth rate of staff
	Reallocation of vorkers	Interaction	Increase of productivity			
1988-1993	-1.29	-0.02	7.74	**6.43**	8.96	7.61
1993-1998	-2.79	-0.15	-0.38	**-3.33**	13.52	14.29
1998-2003	1.68	-0.42	-1.60	**-0.34**	1.22	1.74
1988-2003	-2.20	0.19	5.50	**3.49**	8.93	8.86

Source : INEGI, Sistema de Cuentas Nacionales de México

The comparison of aggregate indicators of labour productivity in the US and Mexico shows a convergence during the period 1960/1981, followed by a divergence in 1981/2005. For the latter period, looking at the level of specific industries and regardless of the very unequal composition of output between the two economies, it is possible to capture the no-convergence in average labour productivity measured in constant 1990 US-dollars. The productivity gap -alternatively, the percentage that the output per worker in Mexico represents within the corresponding output per worker in the US-; widens for the whole of

the manufacturing activities and for the bulk of the industrial divisions in Mexico. In particular, whereas sectors with high presence of globalised activities fail to converge, the process takes place only partially in some industries with an important participation of locally integrated production. It is only the division of Basic metallic industries that converges and presents comparable productivity levels (Capdevielle, 2005). Additional analyses at the level of specific industries develop comparisons of relative productivities using the method of purchase power parities (PPP). These studies document a generalised divergence for the period 1975/1986. In contrast, for the period after the liberalisation process, 1987/1996, they identify a heterogeneous and selective process of convergence in productivity in some specific industries. This process is determined by the exploitation of economies of scope and scale, capital accumulation, FDI and at a lesser extent, assimilation of technical change (Hernández Laos and Guzmán, 2005) In general, there is agreement on the lack of convergence, at an aggregate level, of labour productivity between the two countries.

México-USA

Breaches of productivity

	1980	1985	1990	1995	2000	2004
TOTAL	n.d	n.d	19	18	19	18
AGRICULTURE, HUNTING, FORESTRY AND FISHING	n.d.	n.d.	5	6	5	6
MINING AND QUARRYING	n.d.	n.d.	20	23	26	27
TOTAL MANUFACTURING	35	30	28	26	23	22
FOOD PRODUCTS, BEVERAGES AND TOBACCO	30	26	29	28	42	41
TEXTILES, TEXTILE PRODUCTS, LEATHER AND FOOTWEAR	45	37	33	29	23	22
WOOD AND PRODUCTS OF WOOD AND CORK	28	27	26	34	37	35
PULP, PAPER, PAPER PRODUCTS, PRINTING AND PUBLISHING	24	25	28	33	38	39
CHEMICAL, RUBBER, PLASTICS AND FUEL PRODUCTS	42	30	28	28	27	26
OTHER NON-METALLIC MINERAL PRODUCTS	59	50	44	48	54	55
BASIC METALS	44	45	65	99	109	101
METAL PRODUCTS, MACHINERY AND EQUIPMENT	30	24	21	17	15	15
MANUFACTURING NEC; RECYCLING	90	60	35	32	28	25
ELECTRICITY, GAS AND WATER SUPPLY	n.d.	n.d.	13	12	12	12
CONSTRUCTION	n.d.	n.d.	8	7	7	7
WHOLESALE AND RETAIL TRADE; RESTAURANTS AND HOTELS	n.d.	n.d.	39	31	30	27
TRANSPORT AND STORAGE AND COMMUNICATION	n.d.	n.d.	24	23	24	23
FINANCE, INSURANCE, REAL ESTATE AND BUSINESS SERVICES	n.d.	n.d.	46	47	46	45
COMMUNITY SOCIAL AND PERSONAL SERVICES	n.d.	n.d.	16	16	16	15
TOTAL SERVICES	n.d.	n.d.	25	24	24	23
BUSINESS SECTOR SERVICES	n.d.	n.d.	32	30	29	28
NON-AGRICULTURE BUSINESS SECTOR	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

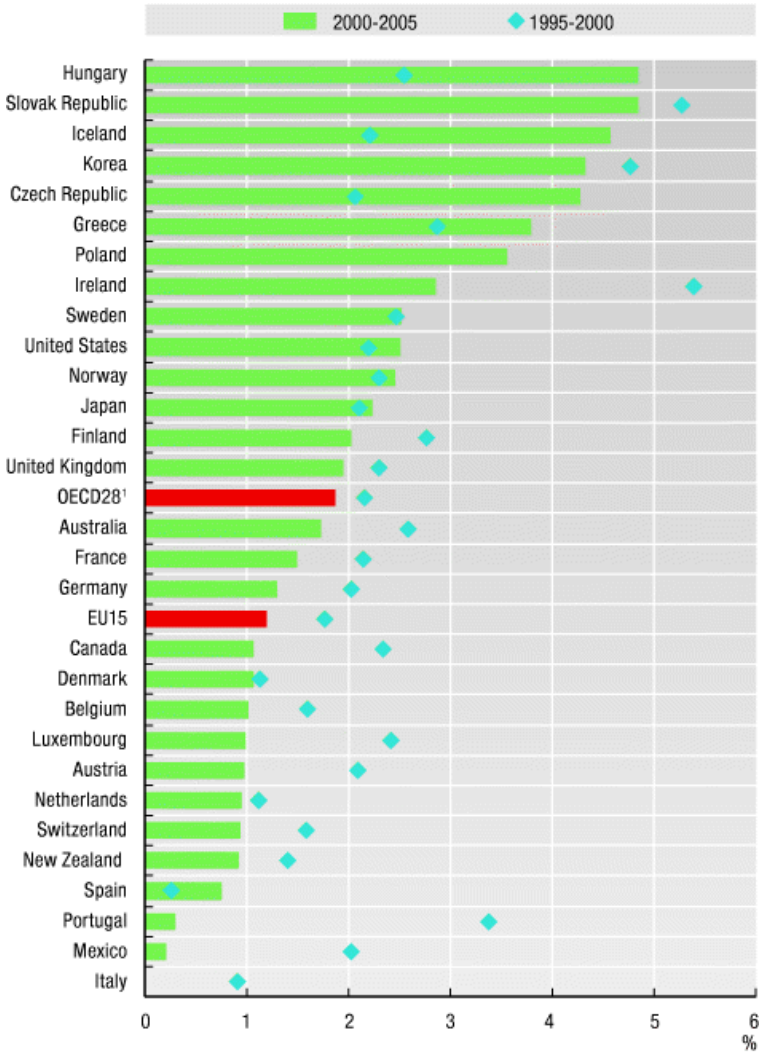
Source: OECD, DSTI (STAN Industrial database)

In short, we can state that global production processes present a low productivity level, which rises slightly along the period of time in question at a lower rate than in the rest of the manufacturing activities. There is no virtuous change in the composition of the industrial production that might increase labor productivity, and this does not converge internationally with United States profitability. Within the branches mostly taking part in global production, productivity is quite homogeneous among companies making it up, relatively higher than in the rest of the branches.

However, the fundamental phenomenon of global production processes is that they can be highly competitive as shown by its export capacity and trade dynamism; they can produce more complex and technology-intensive goods, as well as have an extraordinary global organizational capacity, without increasing average labor productivity. Value added by technology and organizational capacity in these global processes is neither local nor accounted for as such. Today, main local value added to the global product in Mexico is mainly the one related to labor employed.

Comparative analysis from an international perspective shows the very low rate of growth in both labour productivity and TFP. Among the OECD countries, Mexico features the lowest dynamism in both indicators over the period 1995-2000.

Figure 5 Mexico – OECD: Labour productivity growth. Comparison between 1995-2000 and 2000-2005 (Total economy, percentage change at annual rate)


2000-2005
1995-2000
Hungary
Slovak Republic
Iceland
Korea
Czech Republic
Greece
Poland
Ireland
Sweden
United States
Norway
Japan
Finland
United Kingdom
OECD28[1]
Australia
France
Germany
EU15
Canada
Denmark
Belgium
Luxembourg
Austria
Netherlands
Switzerland
New Zealand
Spain
Portugal
Mexico
Italy
0
1
2
3
4
5
6
%

Conclusions

Fundamental transformation of manufacturing activity in Mexico consists of change within the composition, implying an extraordinary growth of export-oriented activities, which take part in the global production processes, while activities not taking part in those processes, mostly aimed at national market and locally integrated, lose importance and reduce their integration level. Structural heterogeneity within manufacturing activities appears in different levels and trends of productivity. Global productivity is low and stable, but the global sector holds high growth level and international competitiveness. The remaining manufacturing industries, with higher and increasing productivity, have a reduced growth, adapting to the international competition and restructuring the local links.

Global production processes are increasingly complex and produce technological developed goods using production processes and periphery technology. Companies involved in such processes in Mexico have increased quality standards and organizational complexity of their facilities that have acquired greater management autonomy and implied an increasing managerial capacity. However, this has been neither the greater creation of value per worker nor the better payment for the factors employed; it only enables the company's survival in a highly-competitive market.

The advantage of the multinational company is that it pays the cost of the international opportunity of factors; and by dividing among segments and by internationalizing production processes, it reduces its total costs within a free trade environment. But not all factors of production have the same mobility; in some cases, capital and know-how applied to production process might be moved geographically, quite easily toward the interior of the same global chain. But this movement does not imply the multinational company allocates value created by such goods to the production link geographically located in a specific nation. Factors moved easily and at low cost from one nation to another, capital assets and production technology add value to the chain where they are produced, not where they are used. Factors, which do not move, or do so with greater difficulty and at a higher cost (employment, communication infrastructure, technological development, etc.) add value based on the market value of each region. The key point of global production processes lies within unequal mobility of factors of production and its relative importance in production costs, as well as in economies of scale, range, or agglomeration they might reach worldwide.

Performance of the remaining non-global activities, which still account for most of the product and the employment despite of its low dynamism, is essential to understand the phenomenon of structural heterogeneity. This sector has been exposed to a high international competition, in many cases, with macroeconomic policies that hindered its adaptation and survival. Productivity growth within a downturn context does not show a virtuous process in general, although some production activities and organizations have deployed efficiency and international competitiveness. These activities belong to mature technological sectors, where big national groups or transnational companies locally integrated stand out. Mexican companies operating worldwide are not highly technological; they constituted and developed their key capabilities during the ISI, and today within an

openness context, they have been able to reach economies of scale and a greater management capacity thanks to the exposition to world competitive levels.

Historical stagnation of the aggregate productivity of the factors in the Mexican economy is caused by and results from the slow economic growth, downturn in income distribution and the kind of productive and business specialization adopted since the beginning of the openness and deregulation model in the eighties. The theoretical discussion on the causality order of these variants is essential to understand the current situation as well as to elaborate public policies for its resolution. Reduced economic growth and its structural heterogeneous feature in particular has not allowed for an efficient use of factors of production and technology.

During the ISI, economic growth and labor average productivity at high rates were accompanied by a high capital accumulation, where the industrial activity was favored by a high public and private investment, the development of economies of scale and the local introduction of technological innovations. However, the growth of TPF (total productivity factor) was not significant for the aggregate economy, stating a little efficient use of the production resources. Leadership of manufacturing sector required significant transfers from other sectors of the economy, which enabled such growth of the investment. The model of the substitute industrialization that generated indisputable productive and technological capacities used up the possibilities of continuity, when these transfers became non-viable together with other multiple factors. During the period of adjustment and change of the development model (1982-1988), fostered by the debt and oil crisis, investment was scared away and productivity became stagnant in all its forms, within a context of contraction of production, labor and remunerations, being these two last the key variables for the adjustment.

The trade openness and deregulation policies implemented since the end of the eighties made radically in a very short period, enabled to recover a reduced growth level of the product and labour productivity with a new increase in investment and stagnation in TFP. This situation is not homogeneous, and some sectors improve significantly their efficiency, but these are neither the most dynamic nor the most important. Formal employment with low remunerations related to the global manufacturing sector, and the informal sector grow. The participation of workers in the product dropped and income distribution maintains high levels of inequity, contributing to financing loss of economy's efficiency as a whole.

Two ways of heterogeneity combine and complement: growth of informal sector of the economy and the global sector of the manufacturing industries. However, growth possibilities over those bases are limited. Mexico cannot compete in the world market on the basis of low salaries, inefficient use of natural resources and geographical closeness to the US.

The efficient use of productive resources makes it necessary reformulate the development strategy and spread productive and technological capabilities. These policies should enable to change the set of factors and productive agents, to generate efficient employment in agreement with growth requirements of the EAP (Economically Active Population), to change composition of production and to increase productivity.

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